Light and Lighting

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First In—First Out?

THERE is an elementary justice in the claim that those first joining the Forces, who have borne the heat and the burden of the day, should be among the first to be released when hostilities cease.

There are, however, other considerations that should be weighed, for example, the need to get quick utilisation of the services of those badly needed for the tasks of reconstruction. One is glad that the Authorities evidently have this in mind.

Lighting experts will undoubtedly be among those urgently needed during the post-war period, and there are none too many of them. Completely new public lighting will be needed in devastated areas, and throughout the length and breadth of the country disused street lighting equipment will require renovation. Many existing lighting installations will likewise need attention, and if, as is anticipated, vast new building schemes are entered upon, these, too, will require artificial light.

Firms in the lighting industry will doubtless make it their business to secure an early release of key men, but all associated with lighting will be needed and additional action by the I.E.S. may be desirable.

Factory Lighting Requirements in India

We receive from Mr. W. A. Ives information of the action recently taken by the Government of India, involving power to demand adequate lighting in general terms in factories concerned with the war effort. The powers are separately vested in the various provincial governments, who, one gathers, are free to make their own arrangements in detail. It is understood, however, that the Central Government is imposing standards based upon the I.E.S. Code and the regulations current in Great Britain, and no doubt something similar will come into general operation. This procedure must have very material influence on practice in industrial lighting in India, as has been the case here

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A.P.L.E. Conference Revived

We give elsewhere (pp. 151-8) an account of the Conference arranged by the Association of Public Lighting Engineers in London last month—the first of the kind to be arranged since the outbreak of hostilities. The revival of what used to be a familiar annual feature is surely an encouraging sign. Although their particular field of lighting has unavoidably been under a cloud during recent years, and little can be said about its development at the present moment, keen interest was shown by public lighting engineers in after-war possibilities. The various papers presented gave rise to good discussions and although the customary festivities of peace-time were naturally absent the secretary (Mr. H. O. Davies) was successful in negotiating a luncheon at which about 100 were present—no mean feat in present circumstances.

More Brains Trusts

As we go to press we receive particulars of "Brains Trusts" successfully conducted by the I.E.S. Centres in Leeds and Nottingham. We must reserve fuller comment, but it may be said that both covered a wide variety of subjects, some of which ("Is light indestructible?") "give one furiously to think." In Birmingham reliance was placed mainly on well-known local members such as Mr. E. G. Phillips, Mr. C. J. Allderidge, Professor H. Cotton, and Mr. Geo. Dixon), whilst in Leeds there was a balanced combination of a physicist (Dr. A. Martin, Leeds), a lighting engineer, (Mr. Stuart D. Lay (Newcastle), and an architect (Mr. W. Tockher, Leeds)—with Mr. R. F. Wilson, of the British Colour Council (London).

Forthcoming I.E.S. Meetings

(Provisional List)

SESSIONAL MEETINGS IN LONDON

1943.

Nov. 9th. Mr. W. F. T. Souter on **The Lighting of Public Buildings.** *(Sessional Meeting to be held at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.)* **5 p.m.**

Dec. 14th. Discussion to be opened by Dr. S. English and Mr. R. Maxted on **Street Lighting Specifications of the Future; Should They be Based on the Design of the Unit or the Effect of Illumination.** *(Sessional Meeting to be held at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1.)* **5 p.m.**

MEETINGS OF CENTRES AND GROUPS

1943.

Nov. 24th. Paper on **Ripple Control.** *(Meeting of the Glasgow Centre, to be held at the "Cadoro" Restaurant, Glasgow.)* **6 p.m.**

Nov. 25th. Prof. H. Cotton, on **The Physics of The Discharge Lamps.** *(Meeting of the Nottingham Centre, to be held in the Lecture Theatre of the City of Nottingham Gas Department, Parliament Street, Nottingham.)* **5.30 p.m.**

Dec. Annual General Meeting. *(Meeting of the Leicester Group, to be held in the Leicester Corporation Electricity Department, Demonstration Theatre, Charles Street, Leicester.)* **6 p.m.**

Dec. 1st. Dr. S. English on **The Redistribution of Lighting by Glassware.** *(Meeting of the Newcastle Centre, to be held in the Minor Hall, Oxford Street, Newcastle-on-Tyne.)* **5.30 p.m.**

1943.

Dec. 6th. Lecture on **The Future of Fluorescent Lamp Lighting.** *(Meeting of the Bath and Bristol Centre, to be held in the Pump Room, Bath.)* **7 p.m.**

Dec. 6th. Address by The Chairman of the Centre (Mr. A. Kelso). Followed by Discussion on the **Education and Training of the Illuminating Engineer.** *(Meeting of the Leeds Centre, to be held in the Leeds Corporation Electricity Showrooms, The Headrow, Leeds.)* **5.15 p.m.**

Dec. 6th. Mr. J. O. L. St. Clair on **Infra-Red Radiation and Its Application to Industry.** *(Meeting of the Sheffield Centre, to be held at the Central Library, Tudor Place, Sheffield.)* **6 p.m.**

Dec. 7th. Mr. C. J. Allderidge on **Planning An Industrial Lighting Scheme.** *(Meeting of the Derby Group, to be held in the Borough of Derby Electricity Showrooms, Irongate, Derby.)* **6 p.m.**

Dec. 9th. A Review of Lighting, by an Architect. *(Meeting of the Cardiff Centre, to be held in the Cardiff Corporation Demonstration Theatre, The Hayes, Cardiff.)* **3 p.m.**

Dec. 9th. Mr. I. Quigley on **Infra-Red Radiation; Its Industrial Application.** *(Meeting of the Bradford Group, to be held in the Bradford Electricity Departuent Showrooms, Sunbridge Road, Bradford.)* **6.45 p.m.**

Dec. 10th. Address by Mr. Gillespie Williams on **The Poetry of Light.** *(Meeting of the Birmingham Centre, to be held at the Imperial Hotel, Temple Street, Birmingham.)* **6 p.m.**

Dec. 29th and 30th. Mr. R. O. Ackerley on **Christmas Lectures for Children.** *(Meeting of the Bradford Group, to be held in the Bradford Electricity Department Showrooms, Sunbridge Road, Bradford.)*

(Secretaries of Centres and Groups are requested to send in particulars of meetings in advance, mentioning subject, author, place, date and time of meeting.)

Fittings for Fluorescent Lamps

In what follows we give a summary of the paper on the above subject read by Mr. W. R. Stevens at the I.E.S. Opening Sessional Meeting on October 12th. The paper will appear in full in the I.E.S. Transactions.

The lecture theatre at the E.L.M.A. Lighting Service Bureau was filled to capacity on October 12, when Mr. W. R. Stevens gave his paper on the Design and Application of Fittings for Fluorescent Lamps.

The author only referred very briefly to the familiar characteristics of these lamps, and he broke new ground by discussing fittings for use with them, a subject on which little had previously been said in this country. Dealing first with diffusing fittings, he drew attention to several factors of special interest such as the obstructing effect of the lamp, which gets less as the size of the reflector is increased but becomes greater when the effort is made to accommodate two or more lamps within the same structure. Several questions arise here. One might design a two or three-lamp fitting to give the same light output ratio as a single lamp unit of a given size, but the increased cost of the fitting might make this step hardly worth while. A change in cut-off angle, however, affects efficiency less than is the case for filament units. The desirable temperature for the outside of the glass is 50° C. and it is sensitive to changes up or down. Overheating therefore diminishes the efficiency, yet this consideration has less influence on design of fittings than is the case with filament lamps, owing to the cool nature of the source.

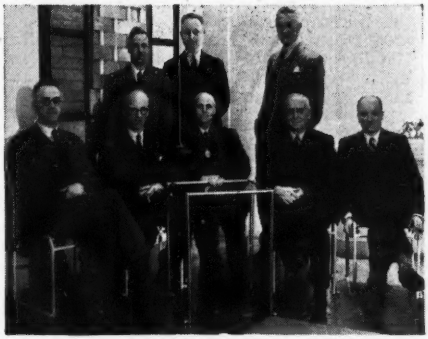
Dealing with specular reflectors, Mr. Stevens showed that intensities of the order of 2,000-3,000 candles might be obtained which, if small compared with the concentration possible from filament lamps, are still worth having. At a later stage he discussed the possibility of using other materials besides metal for fittings, e.g., plastics, for which the conditions are favourable as the temperature is low.

The procedure in making calculations of illumination from these lamps, which are so far removed from point sources, was dealt with briefly. Mr. Stevens also pointed out the advantages and drawbacks of the lamps in connection with certain lighting problems, such as operating tables in hospitals and show-windows. There was, he said, no evidence that the cyclical variations in light could be responsible for eyestrain, nor were stroboscopic effects (less in evidence owing to phosphorescence) of material consequence.

The paper was illustrated by a number of skilfully contrived experiments, and gave rise to a good discussion. Several speakers seemed to prefer that fluorescent lamps should be used high up, without any fittings. It was agreed that polar curves of such lamps were only useful within narrow limits; it was best to assume predetermined values of illumination at specified distances. Dr. Walsh suggested the incorporation in the layer of luminous material of a substance giving still stronger phosphorescence, so as to eliminate "ripples" completely. Mr. Cunnington referred to the apparent monotony of continuous use of fluorescent lighting, and Mr. P. J. Waldram entered a protest against the conception of a windowless building.

Post-War Public Lighting

In what follows we give a summary of the proceedings at the A.P.L.E. Conference held in London during September 22-23. The renewal of this gathering, despite war conditions, is a significant and encouraging event.



A photograph taken in the course of the visit of A.P.L.E. members to the E.L.M.A. Lighting Service Bureau on the evening of September 22. In the front row are Mr. T. Wilkie *(Past President)*, Mr. W. N. C. Clinch *(Vice-President)*, Mr. E. J. Stewart *(President)*, Mr. C. I. Winstone *(Past President)*, and Mr. H. C. Brown *(Hon. Treasurer)*. In the back row are Mr. W. J. Jones *(Director of E.L.M.A.)*, Mr. E. C. Lennox *(Past President)*, and Mr. N. V. Everton *(Member of the E.L.M.A. Council.)*

A well attended and highly successful two-days conference was held in London on September 22 and 23, under the presidency of Mr. E. J. Stewart (Inspector of Lighting, Glasgow).

The proceedings began at the Institution of Mechanical Engineers, Storey's Gate, Westminster, on Wednesday morning, September 22, with the annual general meeting. The Hon. Treasurer reported satisfactory financial conditions, and the Council's Report for the year revealed that the membership of the Association is now higher than it was at the beginning of the war.

It was announced that Mr. A. C. Cramb had been elected an Hon. Member of the Association.

As under a resolution passed at the annual meeting held on November 21, 1940, the President, Vice-President, Hon. Treasurer, and Members of Council were asked to continue in office until the termination of the war, or until such time as shall be determined at an annual general meeting, there was no further business at the annual general meeting

Presidential Address

The President's address comprised a very complete survey of the pre-war position, present conditions, and post-war possibilities. He touched upon sources and fittings; design of installations; research; maintenance; new buildings, especially houses; new or reformed streets, materials and their availability, cost, staff, and employees; central control of lighting and extinguishing; hours of lighting; vehicles; traffic and other illuminated signs; legislation; administration; damage, and decorative lighting, on which he put a number of questions.

Mr. Stewart remarked that not all the problems of post-war street lighting would be due to or even intensified by the war. Many would have arisen in any case, but the war had delayed attention to some and focused it on others. He foreshadowed possible difficulties with regard to supplies of materials in the period immediately following the war, and discussed possible novelties such as the application of the fluorescent tube to street lighting. Certain suggestions that had been made for future street lighting such as self-luminous walls or road surfaces as backgrounds, the use of searchlights, etc., and though fanciful they might not necessarily be impossible. Nevertheless, in all probability we should, for some years, use the same sources as those which we had been using, and generally in similar forms. Such suggestions as lamps set within the kerbs and the use of captive balloons for hanging up the lights (high mounting with a vengeance!) involved obvious difficulties. He mentioned, however, an installation in Texas with mercury vapour lamps on 165-ft. towers.

Would the war cause any change in our choice among the usual means of support for street lamps? Would cast-iron go out and steel be adopted, and what was the effect of the war to be on the supply and design of concrete standards? Would brackets be incorporated in the walls of new buildings, and what had been the experience with span wires elsewhere? They seemed to be in disfavour nowadays.

As regards fittings, there would prob-

ably, for some time, be fewer types on the market than in pre-war days, and also a greater degree of standardisation. Would, ultimately, the already well-known types of fittings be continued? Perhaps the manufacturers would give a lead, although they might prefer to hear from users the likely lines of demand. The possibilities of different types of illuminant for different classes of streets were hinted at, and experiments in Glasgow in this connection before the war were mentioned. Fittings that could easily be converted from low- to high-power lamps were advocated.

Mounting height was mentioned. The President and others, during the Conference, were critical of the recommendations of the Departmental Committee which reported in 1937. The preparation of lighting schemes now was advocated so that immediate action could be taken when the opportunity occurred. Special emphasis was laid on the establishment of testing sections in public lighting departments if only to deal with local problems which are outside the purview of the national laboratories and those of the makers of light-sources and fittings.

Attention was also called to the lighting demands of the new streets which will have to be constructed in large numbers, and here co-operation was urged between architects and town planners and lighting engineers to a greater extent than in the past.

On the question of cost, a warning was given against a possible tendency on the part of public lighting authorities to adopt a scale considerably lower than prevailed before. Hence the need for investigation as how to economise without lowering the standard of illumination or holding back its development. A considerable extension of central control was anticipated in the future. It was stated that, but for the war, all the electric street lighting in Glasgow would have been on central control. Radio control had possibilities.

Would the war leave a greater sensitiveness on the part of the public to glare and what would be the effect upon street lighting recommendations and specifications? Would there be any alteration in administration such as the A.P.L.E., had always aimed at, viz., the recognition of public lighting as a service which deserved independent status, with its own local organisation under an experienced public lighting engineer —or would there be regionalisation?

These and many other questions, the President did not attempt to answer (as, indeed, he hardly could), but the many pointers in the Address give a valuable lead for future action.

Street Lighting—Past, Present, and Future.

In the afternoon, Mr. J. M. Waldram, of the General Electric Research Laboratories, lectured on "Street Lighting—Past, Present, and Future," in which he covered a great deal of ground in a convincing and practical manner. His demonstrations were designed to show the fallacies underlying what have been termed fanciful theories with regard to future street lighting, and in this respect were very effective.

Whilst conceding that we should not feel bound, after the war, to carry on street lighting as had been the case previously simply just because it *had* been done before, Mr. Waldram said the position before the war was quite good. We were making satisfactory and rapid progress in this country, he said, and he inclined to the view that we led the world in the field of street lighting. He did not suggest that we knew all there was to be known or that there were not many new ideas for the application of existing knowledge to be worked out, but we did know what the problem was and how it worked, and we also had a very good idea of what could not be done. Admittedly some pre-war installations were bad, largely because the available knowledge had not been fully utilised. Bad installations also resulted from economic and local problems and no amount of knowledge on the scientific side could resolve these. There were, however, no unresolvable difficulties likely to be met with whilst the geometry of street lighting remained as it was.

After a short discussion, illustrated by lantern slides, on what our pre-war systems of lighting sought to do, Mr. Waldram asked what was the present position? He referred to some of the suggestions that have been made for fundamentally different systems of street lighting, the idea that we should not necessarily think in terms of lamps on poles at regular intervals and the hopes that the research people had something new ready to be put into operation immediately after the war. On the latter point he urged that we must not use the term "pre-war" as being synonymous with "out-of-date," and went on to explain that whilst the research laboratories—at all events the G.E.C. Laboratories—had been busy on lighting problems in connection with the war effort and illuminating engineers now had a very much better kit of

tools, they had not been allowed to apply it to normal street lighting problems. Therefore there was not, under the counter and ready to be brought out immediately after the war, something new and staggering in regard to street lighting, and for a while we should have to proceed on more or less the lines adopted previously. No doubt there would be new fittings, lamps, and materials. Plastics and light aluminium alloys would find their way into the manufacture of street lighting fittings in increasing quantities, but much had to be done before the stage of practical application. He was unaware of any great development in lamps, with the possible exception of the 80-watt fluorescent lamp which, however, at the moment did not seem a very good source for street lighting purposes.

Finally, Mr. Waldram referred to new systems of street lighting which have been proposed, such as suspending lamps from balloons at great height, lighting from the kerbs, the use of projectors to focus light in the direction of the traffic, and even the use of searchlights for reflecting the light back again to the street surfaces. Not the least interesting and attractive portion of the lecture were the demonstrations which had been prepared to show the practical futility of some of these ideas at the moment, and particularly the use of lamps suspended from "barrage balloons" and reflection from the sky of the beams from searchlights. However, whatever might be the position from the points of view expressed, he urged lighting authorities to avail themselves of the services of competent lighting engineers and to give them freedom to make the fullest possible use of available knowledge.

There was a useful discussion of the lecture. More than one speaker favoured the establishment of some central authority which would supervise the lighting of roads in county, borough, urban, and rural areas and remove the anomalies which the present multiplicity of control involves. Another suggestion was the use of lamps on short posts between the normal standards to remove the black patches often existing between the lamps as at present spaced, and it was added that these additional lamps might be an alternative form of lighting in case the main lighting supply failed. Then a warning was issued that lighting engineers should not take all their ideas from the people who sold fittings—although another speaker did not mind this so long as he could do as he pleased with the fittings when he got them, and he thanked the manufacturers for what they were doing. Yet another idea was the distribution of the light in wide beams across the roadway instead of along it. Another warning was against the alleged tendency to over-spend on lighting arterial and main roads to the detriment of the secondary roads. One speaker asked Mr. Waldram how he would light a street if he had a perfectly free hand and as much money as he wished! Mr. Waldram later frankly admitted that he did not know. Then a speaker asked what were the qualifications for a public lighting engineer, and Mr. Waldram said he looked forward to these being laid down.

Visit to E.L.M.A. Lighting Service Bureau

On the invitation of the Chairman and the Council of the Electric Lamp Manufacturers Association, a visit was paid to the Lighting Service Bureau, Savoy-hill, London, on Wednesday evening, September 22. The excellent facilities of the Bureau were demonstrated to the delegates, and great interest was shown in various demonstrations of lamps and fittings and their application. The E.L.M.A. was cordially thanked for its hospitality, as was the British Commercial Gas Association on the following day when the delegates were entertained at tea at Gas Industry House.

The Design of Lamp Columns and Lanterns

The Conference was resumed on Thursday morning, September 23, at the Institution of Mechanical Engineers, when two addresses were given by Mr. H. C. Bradshaw (secretary of the Royal Fine Art Commission) and Dr. S. English (of Holophane, Ltd.). The design of lamp columns and fittings in relation to post-war town planning and reconstruction was dealt with from two rather different though interrelated standpoints.

Mr. BRADSHAW expressed the hope that the many new streets that will be constructed after the war would not take on the appearance of so many existing streets, with their conglomeration of posts, standards, and signs, all having no relation to each other and installed by different authorities, very often to meet the exigencies of the moment. The Royal Fine Art Commission has approved a certain number of lamp-post designs for re-planned areas—which in themselves have not escaped criticism from

the aesthetic point of view—but the avowed desire of the Commission is simplicity of design and the avoidance of what is known to artists as "vulgarity." Also the avoidance of designs in various areas which represent the personal idiosyncracies of the particular local authority. In other words, greater standardisation of height, design, and general appearance over larger areas, with standards of a height to suit the width of the street. It was admitted that these approved designs will have to be submitted to the test of being used in conjunction with suitably designed lamp fittings. Therefore, a further study of the problem is needed. Mr. Bradshaw expressed satisfaction at the unmistakable signs that this need for study and improvement is being recognised by those responsible for putting these standards in the streets.

The Fine Art Commission hopes to avoid in the future a state of affairs described by Mr. Bradshaw as existing at a certain roundabout in the London area: viz., eleven Belisha beacons, thirteen "Keep Left" signs, eight direction signs, four assorted notice boards, a pole in the centre containing a light which flashed at night, a telephone kiosk, a police box, a fire alarm post, numerous small posts, and a horse trough! The solving of this problem obviously goes far beyond that of providing a suitably designed street lamppost; but it is linked up with any attempt at improving the aesthetic appearance of our streets in which street lighting engineers must play an increasingly important part.

Dr. ENGLISH discussed the design of street lighting lanterns from the aesthetic point of view for post-war conditions, and in emphasising the need for ensuring that every item of equipment is not only efficient but of *good* design, stressed the difference between "artistic design" and "good design." If an "artist" were given a free hand he would probably express himself in works that were so confused as to be beyond the comprehension of the man with a well ordered mind. Such exotic expression was not "good design."

Dr. English postulated the following five characteristics of good design: Correct proportion of parts; unity of character or style; correct balance—or arrangement of parts; uniformity of scale of details; uniformity of form, i.e. no sudden interruption between adjoining parts. They should merge into one another quite naturally.

He said that lectures bearing on the design of glassware were apt to be vague and unpractical. The authors had been trained in art only and were not technicians. He recalled that some years ago a progressive Swedish glassmaking firm had sent young art students into the glassworks, to mix and live with the glass workers, to learn the characteristics and properties of molten glass and the various methods by which it could be worked. The art students were then put to manipulating the glass and thus learned the limitations of their material. Then they were set to applying what they had learned to new designs. In this way they gradually evolved the characteristic type of delicate artistic glassware now recognised as typical Swedish glass.

If British artists were to pull their full weight in assisting our industries, they would have to follow a similar course. In the absence of such men capable of dealing with street lighting fittings, there were two alternatives: One was to try and develop an aesthetic sense and an appreciation of good form in our technical designers; and the other was to combine the two essentials in the form of a committee representing both aspects. Which course we should find it best to adopt would depend on the characteristics of the available personnel. The latter alternative seemed to have worked well in the case of lamp columns, as the designs referred to by Mr. Bradshaw represented the joint efforts of technical designers and the Royal Fine Art Commission. This collaboration would very materially raise the artistic standard of the lamp columns used in post-war years.

Dr. English then discussed the correctness and suitability of the lantern in relation to (1) the lamp to be used; (2) the pole to which it is to be attached; (3) materials and processes to be used in its production; and (4) its surroundings. Commenting on some past examples of design which was not now to be regarded as "good," he referred to *The Illuminating Engineer* for October, 1909, showing various designs the ornamentation of which he maintained, from present standards, spoiled both the columns and the lanterns. At the same time he hinted that our ideas to-day might not be any better than those held thirty or forty years ago. As in the case of columns mentioned by Mr. Bradshaw so in the case of lanterns we must now look for simple lines and correct form, perfect proportion and balance and, above all, practicability from the manufacturing, in-

stallation and maintenance points of view.

Illustrations were then shown of imperfect models all too common in this country at the present time, and possible alternatives were suggested. Emphasis was laid on the necessity for deciding the type of lamp for which the lantern is to be used and relating this to the character of the thoroughfare which, in turn, is related to the type of standard which should be adopted. Designs were shown in which the lantern and the standard have smooth, simple curves that rely on their simplicity and correctness of form for their beauty and appeal.

There was little time for discussion on these two papers, but attention was called to the fact that whilst the two authors had given attention to the artistic side of this problem, there is an essentially practical one which must be taken into account. In many streets there are trolleybus and tramway standards which must be used on the score of economy, and attention to the design of these for the purpose of street lighting was urged. On the other hand, Mr. J. S. Dow remarked that in a sense all poles and standards might be regarded as excrescencies on the road surface. The President had recently reported that 1,000 had been damaged by collision during the war in Glasgow alone, and thought it might still be worth while considering the occasional use of some of the so-called fantastic ideas which had been mentioned earlier in the Conference. Mr. Bradshaw said he could not conceive how standards could be done away with completely. Dr. English, however, mentioned a German city in which the street lighting was carried out by means of floodlights on the roofs of the buildings in a thoroughfare similar to Regent-street in London.

Luncheon at the Savoy Hotel

Following the morning session at the Institution of Technical Engineers on Thursday, September 23, there was a reception and luncheon at the Savoy Hotel. The President was again in the chair, but, unfortunately, owing to the wartime restrictions, the number present had to be limited to about 100, although many more desired to attend. The principal guest, Mr. J. Noel Baker (Parliamentary Secretary to the Ministry of War Transport) was prevented from being present owing to pressure of official duties, and his place was taken by Sir Charles Bressey, late Chief Engineer to the Ministry of Transport. Sir Charles can always be relied upon to make both an entertaining and a practical speech, and he did not fail on this occasion. On the more serious side of street lighting he spoke of the need for more unified control throughout the country, and paid Glasgow the compliment of being far ahead of London in this respect. Speaking with regard to the design of lamp standards, he urged a little more ornamentation by way of incorporation of receptacles for flowers, which has been done in some towns already—he specially mentioned Salisbury, although there are others. Illuminated fountains were also suggested as another means of adding gaiety to our streets. On the broad question of public lighting he asked the Association in its programme for the future to lay stress on the need for more uniformity in lighting, and referred to the recommendations of the Departmental Committee in 1937, which he suggested should be generally adopted.

Mr. Percy Good (Director of the British Standards Institution) replied to the toast of "The Guests," and, commenting on the many interests represented at the luncheon—gas, electricity, appliance manufacturers, and science—said they were all anxious to assist the work of the Association in every possible way. At the same time he expressed the hope that public lighting engineers would receive the fullest assistance from their authorities and that there would be a full appreciation of the value of adequate street lighting and flood lighting of buildings in the interests of public health and well being.

Street Lighting with Gas

The final session of the Conference was held, following the luncheon, at Gas Industry House, Grosvenor Gardens, London, S.W.1, when a comprehensive paper was presented by Mr. W. J. G. Davey and Mr. W. Hodkinson on "Post-War Street Lighting—with special reference to Gas." The paper divided itself into two parts; the first being essentially of practical nature and the second of a more scientific character, in which various nomograms for purposes of calculation were presented.

The importance of planning now for post-war street lighting was stressed. The authors, however, criticised strongly some of the recommendations in the B.S.S. for Street Lighting (No. 307/1931) and in the final report of the M.O.T. Committee. A strong point was made that visibility and not lumens output is

(Continued on page 158)

NOV. 11
PLEASE GIVE GENEROUSLY
REMEMBRANCE

CORRECT LIGHTING is an extra hand

IF war-workers had three hands instead of two it would substantially help output. Obviously they cannot be given a third hand, but they can be provided with such perfect seeing conditions that two hands can almost do the work of three.

GOOD SEEING HELPS OUTPUT

It may be difficult to believe that correct lighting can actually assist production, but there is a substantial and indisputable array of evidence to show that correct lighting does in fact do so.

GOOD SEEING REDUCES ABSENTEEISM

Correct lighting prevents premature fatigue and counteracts strain. Consequently it reduces absenteeism through minor ailments and is an important factor in eliminating accidents.

GOOD SEEING REDUCES WASTE

Correct lighting is a proven economy in other directions too. It reduces spoils during processing and exposes faults and flaws in "raw materials." Above all, it helps to overcome the handicap of poor sight imposed by advancing age. It is a fact that elderly workers need up to 50% more light than youngsters.

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Lighting Advisory Service
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Telephone: TEMple Bar 8040

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(Continued from page 156)

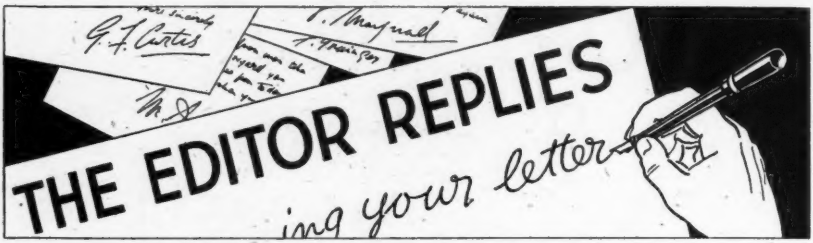
the object of all street lighting. The suggested heights of poles was discussed and the use of 3,000 lumens per 100 linear feet was regarded, in some circumstances, as excessive. The lumens per 100 linear feet should be related to the road conditions—road width, etc. The narrower the road and the shorter the spacings between lamps the less lumens per 100 linear feet would be required for adequate illumination. Street lighting installations should be assessed on quality rather than quantity of illumination.

The length of the paper left little time for discussion, but there was some criticism of the recommendations with regard to height of poles, it being urged that the height must be adjusted to suit the particular conditions. The authors were reminded, however, that although they had emphasised the cost of changing over to the Ministry of Transport recommendations, the final report contained the proviso that, where satisfactory lighting was being obtained with the present installation, there need not not be a change-over. Indeed, said this speaker, in many cases there would not be the money to do it.

Protective Lighting for Industrial Purposes

This problem is effectively dealt with in an American War Standard (1942) which defines the aims of protective lighting, sketches specifications for the treatment of boundaries, fenced-in areas, etc., and includes a very substantial appendix in which technical details are presented.

In our country, owing to the enforced blackout, "protective lighting" in the American sense is scarcely possible. In the U.S.A. the problem is essentially different, and protective lighting, a wartime auxiliary designed to combat darkness and serve as a protection against sabotage and disorder, plays an important role. Incidentally, this is one of the few cases in which the production of glare (to baffle the unauthorised intruder) is deliberate and helpful. The information given in regard to lighting equipment, control circuits, and the design of installations for specific purposes should be very valuable to those able to apply it.



My comments on the result of combining a specified minimum illumination with a **limitation to Diversity Factor** in last issue (Sept., 1943, p. 145) have brought a letter from Mr. J. H. Nelson, who suggests that it is mainly when intense local lighting is used that this limitation is needed. I agree that there is something to be said for this, as backgrounds are often much too sombre. If, however a reasonable background brightness (say 1-10th of the average brightness of the work) is attained the eye should not suffer—unless the variation in illumination on the work is such that the nominal value is vastly exceeded.

I received inquiries some time ago in regard to the type of **luminous projection pointer** forming a bright image of an arrow on a lantern screen, as used by the Institutions of Civil and Mechanical Engineers and other bodies. This apparatus is made by Messrs. Taylor, Taylor and Hobson, Ltd., of Leicester (whose late Chairman, William Taylor, presented a specimen to the Institution of Mechanical Engineers when President of that body). There are several of these instruments in stock, of which any readers still in need of this ingenious device will no doubt take note.

A letter from Australia discusses a broadcast, touching on the **value of colour in factory decoration,** given by Mr. R. F. Wilson of the British Colour Council. Mr. Wilson on that occasion emphasised the value of light background in preventing the "tunnel effect" in factories, and likewise the utility of judicious and harmonious colour contrast in the scheme of decoration—as has been adopted with success by some firms—though he does not suggest that this benefit can be easily expressed in numerical terms. There is a lot to be learned in regard to the psychological effect of colours so used. We need to be safeguarded against the enthusiast who says, "Oh, yellow is a cheerful colour!" and proceeds to decorate large areas in a vivid mustard hue. It may not be desirable, even, to produce an effect which is *arresting and initially pleasing.* The workers have to live with this coloration day by day; therefore something of **enduring and tranquil charm** (if attainable) is to be preferred.

I have had a call from Paymaster Captain Hoare, an I.E.S. member who has been responsible for some ingenious methods of picture lighting and for other devices, to which I may have occasion to refer in another issue. For the moment, however, I would like to comment on an

idea he has brought to my notice—that an **inscription in white on black** (e.g., white chalk on a blackboard) may be better than the opposite and more usual arrangement of black on white (as on the printed page).

I have heard this idea before, and to my mind the decision depends on circumstances. At a very high illumination (thousands of foot-candles perhaps) we *do* get the effect of **irradiation or "halation,"** i.e., the bright, white surround impinges on the black letters or design, causing it to appear less distinct. If this high brightness is attained one might get better results by making the letters or design bright and the background dark—and this is perhaps one reason why, with **internally lighted signs,** this method is so widely adopted.

But at ordinary illuminations, such as one normally adopts for reading, the effect is not in evidence, as Lythgoe's experiments on the effect of increasing illumination on visual acuity have shown. **At very low illuminations,** such as those experienced in the black-out, when **the eye needs all the stimulation it can get,** the light background is definitely advantageous—from the visual standpoint. There is, of course, the further point, which Captain Hoare has rightly emphasised, that a "white on black" sign has a much lower integral brightness and should therefore be less open to objection from the A.R.P. standpoint—but that, as Kipling used to say, "is another story."

Power Factor Correction for Electric Discharge Lamps

by FRANK BAKER

Many articles have been written on electric discharge lamps: their characteristics and method of operation. It is with the latter point that this article is concerned.

As we know, electric discharge lamps must be operated with certain control gear, therefore the lighting engineer must not only be fully conversant with the characteristics of the actual source of light, but also with the characteristics of the control gear. This control gear for electric discharge lamps usually consists of a "choke" coil and a small condenser for the power factor of the lamp circuit. Lighting engineers should interest themselves a little more in this question of power factor because of its economic value in lighting schemes—which becomes of special importance at the present time owing to restrictions imposed on the supply and use of condensers.

So let us review, briefly, this side of a lighting engineer's work, bearing in mind that this article is not intended to delve deeply into the complexities of power factor and methods of correction, but rather to view it in an elementary way in relation to the economics of a lighting scheme. It will, of course, be appreciated that the subject only applies in cases where this form of lighting is used and where the electricity tariff is based on either a yearly or monthly kVA maximum demand.

In any A.C. circuit, the introduction of inductive apparatus causes the voltage and current curves to be out of phase, and the cosine of the angle of phase displacement is a measure of power factor. This condition arises in the circuit of an electric discharge lamp owing to the use of the "choke" necessary to operate the lamp, hence the use of a small static condenser to improve the power factor of the circuit.

When the power factor is, say, 0.5, the circuit is, in effect, operating at only 50 per cent. efficiency; in other words, the current demand from the mains is twice what it should be if the circuit was operating at a power factor of 1, i.e., 100 per cent. The expressions "apparent power" and "true power" are often used in this connection, the difference between the two values being that which is considered "idle" in the circuit—but for which, nevertheless, the consumer is paying in the kVA maximum demand charges.

Measurement of power factor can be accomplished in one simple way by means of a volt-amp meter and a watt meter; the resultant readings when expressed in the form $\frac{W}{VA}$ give the power factor of the circuit. If the readings are identical and thus give a ratio of 1, the circuit is at maximum efficiency; this state, however, is seldom attained where there is an inductive load in an A.C. circuit. The general practice considered most economical is to achieve a power factor of from 0.9 to 0.95 by means of corrective apparatus.

Manufacturers of electric discharge lamps usually recommend small condensers of sufficient capacity to be included in the lamp circuit to achieve a power factor in the order of 0.9. The method of applying condensers to improve the power factor of the lighting system can be done in several ways, either by allotting one condenser to each lamp, or one condenser to each switching circuit, or one condenser to the complete system. The usual practice is to follow the first method.

Whatever method of correction is adopted the important point is its economic effect on the corrected system. The following comparative costs illustrate the economic value of such correction. Let us assume that the consumer's electricity tariff charges are those generally found in industry; this is usually a two-part tariff based on either a monthly or yearly kVA maximum demand charge plus a small kWh charge. The first part of the tariff concerns power factor. When it operates on a monthly basis the average price charged is usually of the order of 10s. per kVA.

The following table shows the kVA charges for a comparatively small lighting system of electric discharge lamps having an installed load of 10 kW.

Installed Electric Discharge Lighting Load—10kW. Maximum Demand Charge — 10/- per kVA per month.

P.F. of Circuit	*kVA*	*Monthly Charge*	*Yearly Total*
0.9 ...	11.1 ...	£5 11 0 ...	£56 12 0
0.5 ...	20.0 ...	£10 0 0 ...	£120 0 0

Thus with a power factor of 0.5 as compared with a power factor of 0.9,

the difference in favour of the latter is of the order of £64 per year, which, over an assumed life of the equipment of say, ten years, makes the very appreciable amount of £640.

The economic value of a high power factor cannot be overstressed. This fact is emphasised by the fact that most electric supply authorities include in their supply agreements a power factor clause which usually states that the consumer shall maintain an overall power factor of not less than 0.8 or 0.85. It is in the interests of both the consumer and supply authority to reach and maintain as good a power factor as possible.

This article is not intended to explain in detail the origin of the power factor nor its methods of correction, but merely to emphasise its economic importance in relation to lighting schemes utilising electric discharge lamps. When any such scheme is being planned and installed the economics of the scheme should be viewed from all angles. Much effort is often expended in obtaining the benefits of improved lighting in the most economical way. In addition to lighting technicalities the influence of power factor should not be overlooked.

Permanent Contrast

The white traffic lines on road surfaces, so valuable in the black-out, will, it is hoped, be retained after the war.

It is stated that some authorities are already taking steps to render such lines permanent by introducing suitable light substance in the material on the road surface. One hopes that, similarly, the idea of permanent white borders for pavements will be considered when new roads are being made up. Even when permanent measures are too costly or impracticable, the marking out of objects or borders (e.g., at the dockside) by white paint might well be continued. The contrast thus created is invaluable at very low illuminations, but it will remain exceedingly helpful even when normal lighting is restored.

Fluorescent Lamps Solve Special Problems

The illuminating engineer is not infrequently faced by jobs involving special problems which cannot be easily solved by ordinary methods. Such a case is that of the works here illustrated, where a Benjamin lighting scheme based on the use of fluorescent lamps was introduced.

This particular part of the works is in the basement of a building which receives no natural light. The system must therefore be good enough to permit continuous work by artificial light, without sense of strain and without the operators feeling "shut in." The problem was rendered more difficult by the fact that the ceiling was only 10 ft. above the floor, and by the presence of

Fig. 1. Overhead lighting with fluorescent lamps.

numerous girders, trunks, and pipes immediately below it. Furthermore, the work was of an exacting nature, requiring exceptionally good illumination and diffusion.

In solving the problem use was made of Benjamin Flurolier reflectors, mounted close to the ceiling, as shown in Fig. 1. The extensive area occupied by the sources of light ensures good illumination below, notwithstanding the obstructions. The high degree of diffusion is well illustrated in Fig. 2, which shows a close-up view of the multiple drills. In addition to the high illumination provided there is a complete absence of harmful shadows.

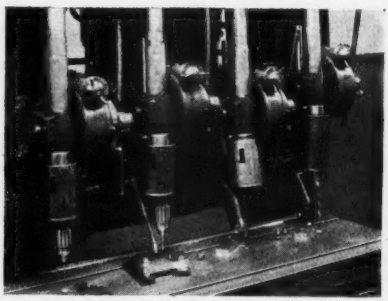


Fig. 2. A close-up view of drills showing the "shadowless" conditions.